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Universe

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Looking Sharp

Curiosity rover ready to explore Gale Crater mountain

By Mark Whalen

Now that the Mars Science Laboratory rover Curiosity has reached the base of Mount Sharp, everything is looking up.

Two years after landing on the Red Planet's Gale Crater, the rover is ready to carry out more of its original exploration plan. Within months after landing, Curiosity fulfilled its primary science goal by determining that Mars offered environmental conditions favorable for the development of microbial life.

As mission planners consider the rover's next moves, Curiosity waits on the flat floor of Gale Crater. The elevation increases significantly for the trip up, with a break in slope between the crater floor and the start of Mount Sharp itself. The rover will begin its ascent by exploring the mound's lowest and oldest layers.

"If you think of Mount Sharp as a story with chapters in it, we'll be exploring the first chapter," said Curiosity mission scientist Katie Stack. "That's why we're excited about being at the base; we're starting with the oldest layers and then moving up to younger and younger layers."

The rover is now at a key boundary that separates the sediments of the Gale Crater floor and the layers of lower Mount Sharp. Curiosity's latest exploration target is Pahrump Hills, an outcrop section of the Murray Formation, where the mission team will likely conduct its first drilling at the mountain's base. Curiosity Project Scientist John Grotzinger said the rover arrived there Sept. 19.

The Murray Formation has sparked scientists' interest with its alternating bands of light and dark rocks. A key question is whether the bands represent sedimentary layers of different composition, or whether they formed by a process that occurred after the rocks were deposited.

"Either way, we think this banding is really key to understanding the origin, geologic history and habitability of ancient environments preserved in the Murray formation," noted Stack.

Based on orbital data, particularly from a camera on Mars Reconnaissance Orbiter, the science team was "astounded" upon discovering that the Murray formation was 200 meters thick, she said. For comparison, the Yellowknife Bay formation, where Curiosity explored its first environment, was only five meters thick.

"So those couple of meters at Yellowknife Bay may represent thousands to hundreds of thousands of years of depositions; at the Murray formation there are potentially millions to tens of millions of Martian history, just waiting for us to explore," said Stack.

Curiosity's ultimate goal is to reach and study another major geologic feature, a hematite ridge that is about 1 to 1½ kilometers away from its current position.

"We see a major change in the style of layering as we go from Murray to the hematite ridge," said Stack. "Layers are pretty hard to pick out in the Murray formation and hard to trace laterally one way or the other. But as we go up the hematite ridge, layering becomes much more clear.

"The transition from older clay rocks to younger sulfate rocks has been observed at a number of places around Mars," she added. "That's why we think there may be some global significance to the changes we see. We know from orbital images that this transition in layering also goes along with a major change in mineralogy at the layers. So the burning question is whether these physical and compositional changes also represent changes in habitability in Gale Crater over time," she added.

Scientists are on the lookout for a key indicator of silicon, an element that is highly mobile as a chemical substance in water. Its depletion—or its enrichment—

Above is the first sample-collection hole drilled in Mount Sharp, at "Confidence Hills" on the "Pahrump Hills" outcrop at the base of the mountain. Curiosity's Mars Hand Lens Imager took the picture Sept. 24 from 2 inches (5 centimeters) from the target.

can indicate that a rock formed in an aqueous environment. Grotzinger said a rock called "Bonanza King" on the slopes of Mount Sharp contained very high silicon relative to all other rocks studied on Mars, except for those at Columbia Hills studied by the Mars Exploration Rover Spirit.

"The high silica content is something different for us, and we're optimistic that we're going to be able to talk about a science story in the next few months that involves water," Grotzinger said. "Silicon is also an element that we know, based on our Earth experience, can be associated with the preservation of organic matter. We're so excited about it because it goes in the right direction for us. The addition of silica can be a good thing for preservation."

When Curiosity hits the road again it will do so over a friendlier surface. The rover's wheels have sustained some damage, such as tears and holes, as it has moved over sharp, rocky areas.

"We now understand how to drive on this terrain and we understand how we can plan routes to minimize the damage," said Project Manager Jim Erickson. "In general, I'm very positive that we're going to be able to get a lot more mileage out of these wheels."

"The Murray formation has a number of interesting targets; the hard part for us as a science team is going to be to evaluate what the priorities should be in terms of how much time to spend at Pahrump Hills vs. moving on to some other place in the Murray formation," Grotzinger added. "That will depend what we find when we get to Pahrump Hills."

Added Stack: "If the past two years of Curiosity's exploration are any indication, we're going to see exciting things that we have never seen before and couldn't possibly have anticipated."

Universe taking the digital leap

In keeping with the times, Universe is going all-electronic. This is the final issue to be printed on paper.

Future editions of the newspaper will continue to be produced monthly in the form of PDF files. Employees and on-site contractors will be notified of new issues through labwide emails.

JPL retirees can sign up to be notified of new issues by visiting: *http://www.jpl.nasa.gov/universe*. Back issues are available at the same site

To commemorate this major step, page 3 of this issue presents a brief history of the newspaper's colorful past.

Conserving a precious resource

Lab has saved hundreds of millions of gallons of water in recent years

By Mark Whalen

Many drought-resistant plants have been planted near Building 318.

Water conservation in Southern California is increasingly more important as seasons of drought become more severe. In fact, the current drought condition is one of the worst in California's history.

JPL is doing its part to save water. Water-conservation measures taken at the Oak Grove site in recent years have far exceeded mandates for federally owned facilities—to the tune of about 30 million gallons saved annually since 2007.

As are all federally owned facilities, JPL is mandated to reduce water consumption by 2 percent per year (2007 baseline year), with an overall reduction of 26 percent by 2020. Facilities Energy Manager Steve Rigdon said JPL is "significantly" surpassing the 2020 goal.

"We're doing very well," said Rigdon. "We have achieved an annual reduction of greater than 35 percent over the last seven years." He said the 30 million gallons of savings has come predominately from landscape irrigation reductions and implementations of xeriscape landscaping, which reduces the need for irrigation.

JPL has also implemented new methods to use less water in buildings, which Rigdon expects will result in possibly 17 million more gallons of water saved annually. Over the last four years, JPL has implemented several Department of Energy energy-savings performance contracts that include equipment upgrades.

More than 1,360 toilets, 824 sinks and 54 showerheads have all been upgraded with low-flow devices. JPL's landscape irrigation system also received a significant upgrade providing leak detection, monitoring and metering of all irrigation flow, along with a programmable evapotranspiration and rain bucket system, which allows for irrigation based on evaporation. And about 4,500 sprinkler heads were replaced with more efficient, low-flow rotator sprinkler heads delivering multiple rotating streams rather than a simple spray type heads.

But with all the recent efficiency, it turns out that the biggest water consumer on lab isn't for people to use.

Through fiscal year 2013, JPL has consumed about 80 million gallons overall, half of that for the 15 heating, ventilation and air conditioning cooling towers throughout the facility. Cooling towers provide the most efficient method for removing heat from air conditioning systems as well as an efficient means for removing heat from lab equipment. The heat transfer is by water evaporation, so cooling towers consume a significant amount of water.

In terms of water conservation, the towers are operating at maximum efficiency, Rigdon noted. "There's not much more we can do at this point," he said. "Instead of a single-pass cooling tower system – where the water cycles through just once and drains right out -- we have a multitasking system where the water cycles through several times before we have to dump it."

There are more opportunities to save water in future years. JPL's five-year plan calls for low water-consumption trees to be planted when existing trees die off. About 100 drought-tolerant trees are now being planted annually, Rigdon said, adding that many drought-resistant trees develop root systems that go deep underground, thus using ground water rather than water from sprinklers. "Once they get established you don't have to water again, in some cases," he said.

Other opportunities being analyzed include using artificial turf as a replacement for natural grass and utilizing a NASA groundwater cleanup project for cooling tower supplemental heat rejection. The project produces 75 degree F water at 350 gallons per minute 24 hours a day, seven days a week.

Aside from saving water, there are ancillary benefits to conservation, such as savings on electricity from reduced hours of operation for water pumps. Rigdon added that a reduced dependence on water utility providers would lead to increased water security for JPL.

"That's one of the first steps in energy and water security: to do conservation measures," said Rigdon. "When you conserve, obviously you're going to need less; conservation will help security as well."

Open House October 11-12

JPL will welcome the public to its annual Open House on Saturday, Oct. 11 and Sunday, Oct. 12 from 9 a.m. to 4 p.m. each day.

Movies and videos on JPL's history, missions and discoveries will accompany a new, interactive art installation inspired by comet 67P/Churyumov-Gerasimenko,

which the Rosetta mission is currently orbiting.

JPL's work in technology development will be a new feature this year. In conjunction with NASA's Office of the Chief Technologist, JPL will highlight recently developed technologies at nine exhibits throughout the Lab. Receiving particular emphasis are cutting-edge technologies with potential applications beyond NASA.

An example is the "Flying Saucers For Mars" exhibit, which will showcase the experimental Low-Density Supersonic Decelerator test JPL flew from Hawaii in June. The project is investigating new breakthrough technologies destined for future Mars missions.

For the first time, the Open House will feature the new Arroyo parking structure to accommodate visitors to JPL. Security Operations Group Supervisor Jim Chaffee said employees and retirees who attend the event may park in the west lot or the parking structure, but employees and contractors who will be working are encouraged to park on Lab north of Explorer Road.

More information on the Open House is available at *http://www.facebook.com/events/694670457270411/*. Guests are invited to ask questions, invite friends and post photos and videos on the site.

Visitors using Twitter are encouraged to use the #JPLOpen hashtag.

70 years of spreading the word

JPL'S EMPLOYEE PAPER HAS CARRIED DIFFERENT NAMES, LOOKS

The Universe newspaper is on the verge of going all-electronic almost exactly 70 years after the creation of the first known employee newsletter at the laboratory.

That was on Oct. 14, 1944, when the first issue of the "GALCIT Ear" appeared. GALCIT stood for Guggenheim Aeronautical Laboratory, the wing of Caltech under which the work at JPL was performed. The newsletter consisted of a simple sheet of typewritten text and a drawing of a stork to commemorate the birth of the news organ.

Although the name "JPL" had been used previously to refer to the lab, it was not applied consistently during the World War II years. Some issues of the GALCIT Ear referred to the lab's physical grounds as "the Project."

As JPL attained its own identity in the post-war years, a new publication came along to spread employee news. In August 1951, an unnamed, eight-page newsletter debuted. In the first issue, a $10 prize was offered for the best name for the newsletter. Of the 106 names submitted, "Lab-Oratory" was chosen and graced the masthead of the second issue.

The magazine-style Lab-Oratory came out monthly, with feature stories on JPL projects interspersed with news from the lab's bowling league and dances. To provide more breaking news, a second employee publication named Universe—or, as some liked to call it, "Uni-Verse"—appeared in August 1970. It and Lab-Oratory coexisted for several years until November/December 1976, when Lab-Oratory stopped publication.

In the following years, Universe went through format changes of paper size and publication frequency. For many years, it appeared biweekly with an emphasis on breaking news from the lab's growing stable of flight projects. After the creation of JPL's public website in 1994, many employees shifted to that and other online sources for hard news. In July 2006, Universe went to a monthly publication schedule with an emphasis on background feature stories.

That format will continue as Universe goes digital as of the November issue, appearing monthly in PDF format. The look may be new, but Universe has plenty of publishing history behind it as it steps fully into the online world.

Images courtesy of JPL Archives

News Briefs

Duane Waliser

Leon Alkalai

Sarath Gunapala

Timothy Krabach

Glenn Reeves

Four named JPL Fellows

In recognition of their extraordinary technical and institutional contributions to the Laboratory, four employees have been named JPL Fellows, the top level of JPL's individual contributor career ladder.

The honorees:

Leon Alkalai, Systems Engineering and Formulation Division: For outstanding leadership in mission formulation systems engineering, advancing JPL's business capture efforts through improved approaches to competed proposal campaigns, cultivating a new generation of capture leads through mentoring and workshops, and exploring new business opportunities through his Blue Sky Projects team.

Sarath Gunapala, Infrared Photonics Group supervisor: For pioneering a revolution in infrared detector technology, most notably through quantum well infrared photodetectors and high operating temperature barrier infrared detectors, putting JPL at the forefront of this field for both NASA and non-NASA applications.

Timothy Krabach, Applications Studies Section manager: For seminal and cutting-edge leadership in device physics (focal plane arrays and infrared sensors), microdevice technology and optical systems, resulting in successful NASA and non-NASA projects, and the potential for future applications in these areas.

Glenn Reeves, Systems Engineering and Formulation Division: For groundbreaking, state-of-the-practice contributions to flight software development and flight project systems engineering, expanding JPL's core competencies in autonomy, data management and many other software-resident functions that are crucial to the success of JPL's increasingly complex missions.

Fellows are sought out for advice on strategic technical decisions and for establishing the course for the Laboratory's future.

Waliser in National Academy study

Duane Waliser, chief scientist of JPL's Earth Science and Technology Directorate, JPL has been selected to participate in a National Academy of Science study on developing a U.S. research agenda to advance subseasonal to seasonal forecasting.

Waliser said the committee will develop a 10-year scientific research agenda to accelerate progress on extending atmosphere, ocean and ice prediction at subseasonal to seasonal lead times to aid in decision making.

A 10-year JPL employee, Waliser also currently serves as an adjunct professor in the Department of Atmospheric and Oceanic Sciences and Fellow of the Joint Institute for Regional Earth System Science and Engineering at UCLA and as a visiting faculty associate in Caltech's Division of Geological and Planetary Sciences.

Fulbright honor for Siles

Jose Siles, a radio frequency engineer in the Submillimeter-Wave Advanced Technology Group (389A) and former Fulbright post-doctoral scholar at JPL, has been elected Director for Academic Outreach of the Fulbright Association (Greater Los Angeles chapter).

Siles joined JPL in 2010 after earning a Ph.D. in electrical engineering at the Technical University of Madrid and a postdoctoral position in Paris.

The Fulbright Association has more than 60 chapters across the United States.

Earth science proposals selected

Three JPL proposals have been selected for development under NASA's Advanced Component Technology Program in support of the Earth Science Division.

Ken Cooper is principal investigator for a proposed 183 GHz humidity sounding radar transceiver, which calls for developing a compact, tunable radar transceiver operating in the underutilized short-millimeter-wave frequency regime to enable high-precision global mapping of humidity inside upper tropospheric clouds for the first time.

David Diner will lead proof-of-concept and feasibility demonstrations for an avalanche photodiode/photoelastic modulator-based imaging polarimeter. The concept builds on the successful heritage of JPL's Multiangle SpectroPolarimetric Imager

James Hoffman is principal investigator for a modular, dual-band Ku-Ka antenna tile with digital calibration. Following the successful development of a new, highly accurate, digitally calibrated transmit/receive module, the team will leverage this demonstrated architecture.

Jose Siles

The Advanced Component Technology Program brings instrument components to a maturity level that allows their integration into other NASA technology programs such as the Instrument Incubator Program. Some components are directly infused into mission designs by NASA flight projects, while others graduate to other technology development programs for further development.

Eighty-two proposals were evaluated, with 11 selected for award. The program is administered through NASA's Goddard Space Flight Center.

Data center upgrade underway

A "wall-breaking" ceremony was held Sept. 11 to celebrate the commencement of work on the Building 230 data center phase 2. On hand were JPL Deputy Director Larry James, JPL Chief Information Officer Jim Rinaldi and Facilities Division Manager Bob Develle.

The second phase expands into the former 230-301 area and will address the building's aging infrastructure by adding redundancy, increasing energy efficiency and improving power usage effectiveness to help meet projected demand for computing at JPL. Construction is scheduled to occur between 2014 and 2016.

Passings

Donald Scherff, 94, a retired machine shop supervisor, died June 16.

Scherff worked at JPL from 1946 to 1984. He is survived by his wife, Elva, sister Alberta, three children, four grandchildren and two great-grandchildren. Services were held at Forest Lawn, Covina.

Luther Speck

Luther Speck Jr., 90, retired managing director of the Office of Patent Counsel at JPL, died Aug. 4.

Speck was employed for more than 30 years by Caltech as a patent law attorney.

He is survived by a sister, a son and two daughters, five grandchildren and one great-grandchild. Services were held in Monterey, Tenn.

Frank Marble, 96, a Caltech expert on jet propulsion and fluid mechanics who trained generations of scientists at JPL and Caltech, died Aug. 11.

Frank Marble

Marble helped develop innovations that made rockets more efficient and dampened the noise generated by the turbines in jet engines. He continued working well after his 1989 retirement as a professor of mechanical engineering and jet propulsion.

Marble is survived by his son Steve.

Robert Mueller

Robert Mueller, 73, a retired photovoltaic engineer, died Aug. 24.

A holder of several patents on solar arrays, Mueller worked at JPL for 50 years, retiring in 2008. He provided solar cells and arrays for JPL missions starting in the 1970s with Voyager and continuing through Mars Science Laboratory.

Mueller is survived by sons Mark Vipond and Donald Vipond.

Letters

Joining JPL has been a dream come true! Since college I have helped assemble, test and launch Juno, MSL and OCO 2, and the journey has been amazing. Unfortunately, due to some family issues including a sibling that was diagnosed with MS I feel obligated to move back to the east coast and take a greater role supporting my family. Thank you all for the best times of my life!

Curtis Wilkerson Jr.

I want to thank the Travel Reservations Office for the awesome retirement party and all who attended and contributed to my gift. It has been such a privilege and honor to work at JPL and be able to assist those who needed to travel and the staff who assisted them. JPL is an amazing place to work and we do amazing things. Will look forward to follow the projects as they prepare to launch into space.

Cynthia (Cindy) Moseley

Thank you, my JPL colleagues and friends, for your kindness and condolences. My mother's illness and death have been difficult, and your support is greatly appreciated. Thank you also for the beautiful plant and for the card and gift from my Radar Section coworkers.

Elaine Chapin

It is with heartfelt appreciation that I say thank you to my JPL friends and colleagues for the many expressions of sympathy and support during the recent illness and passing of my mother, Evelyn Atkins, on Sept. 16. The orchid plant is beautiful and was one of my mom's favorite flowers. Thank you also to JPL for the lovely plant sent to my home.

Linda Scott

Retirees

The following employees retired in September: **Linda Lievense**, 46 years, Section 9010; **Nancy Curran-Durland**, 37 years, Section 3515; **Anne Swatfigure**, 37 years, Section 3501; **David Meier**, 36 years, Section 3266; **Steven Silverman**, 29 years, Section 318F; **Michael Kelsay**, 25 years, Section 3350; **Hal Janzen**, 15 years, Section 357E.

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